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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/351,892	07/13/1999	ELWIN M. BEATY	2371	1396

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EXAMINER

CHAWAN, SHEELA C

ART UNIT	PAPER NUMBER
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2625

DATE MAILED: 12/23/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/351,892

Applicant(s)
Elwin M. Beaty

Examiner
Sheela Chawan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Oct 11, 2002
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above, claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 30-32 is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ 6) ☐ Other:

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DETAILED ACTION

Response to Amendment

1. Applicant's arguments filed on October 11, 2002 (paper # 11/a) have been fully considered but they are not deemed to be persuasive.

In the remark, applicants have argued in substance that :

1. Suzuki does not use spherical reflectors .. All reflectors used by Suzuki are planar.

In the reply , the examiner states the following.

As to point 1, with respect to the art rejection , the examiner has carefully considered applicant's argument, but firmly believes the cited reference to reasonably and properly meet the claimed limitation, with respect to applicants argument. The examiner does not agree with the remarks that Suzuki is relied upon to provide these features as stated in the rejection . However, applicant is reminded that the claim language is given its broadest reasonable interpretation and applicant cannot rely upon the features from the specification brought out in the claims because the specification is not the measure of the invention but claims are. First the claim language does not recites a specifics shape of reflectors such as spherical reflectors. On page five the very last paragraph line 22, applicant argues about “ normal vector ” see fig 5, reflect light are not normal to the Suzuki reflector . Suzuki system does implement the normal vectors of reflectors. The reflected light in Suzuki invention depends on the angle of illumination are not the same . By changing the angle of illumination or angle of theta , different reflected lights will be created .

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On page 5, second paragraph applicant argues about obviousness rejection between the reference and for combining the reference etc. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references theme selves or in the knowledge generally available to one of ordinary skill in the art . See *In re fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re jones*, 958 F.2d 347, 21USPQ2d 1941(Fed. Cir. 1992) .

Drawings

2. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Allowable Subject Matter

3. The following is an examiner's statement of reasons for allowance:

Claims 30-32 , are allowed because none of the prior art including Suzuki (US.6,307,210), Nayar (US. 4,893,183) fails to teach or suggest, alone or in combination, with every element of the claim . Claim 30, recites a method for three dimensional inspection of a lead on a part . “ converting the pixel values into world locations by using pixel values and parameters determined during calibration wherein the world locations represent physical locations of the lead with respect to world coordinates defined during calibration , wherein a Z height of

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each lead is calculated in world coordinates in pixel values by combining a location of a center of a lead from a bottom view with a reference point of the same lead from a side perspective view , converting the world coordinates to part values using a rotation, X placement value and Y placement value to define part coordinates for an ideal part where the part values represent physical dimensions of the lead including lead diameter, lead center location in X part and Y part coordinates and lead height in Z world coordinates, and comparing ideal values defined in a part file to calculate deviation values that represent a deviation of the center of the lead from its ideal location ”. Therefore, it is for this reason and in combination with all other limitations in the claims , that claims 30-32, are allowable over the prior art of record .

DETAILED ACTION

Claim Rejections - 35 U.S.C. § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to

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the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1,4,12-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al., (US.6,307, 210), in view of Nayar (US.4,893,183) .

As per claim 1, Suzuki teaches an apparatus for three dimensional inspection of an electronic part, wherein the apparatus is calibrated using a precision pattern mask with dot patterns deposited on a calibration transparent reticle, the apparatus for three dimensional inspection of an electronic part comprising:

(a) a camera (fig 2a 1, column 2, line 62) and an illuminator for imaging the electronic part (column 2, line 65, column 9, lines 52-56, fig 14, 20 and 22) , the camera being positioned to obtain a first view of the electronic part (note, fig 2a element 1 camera taking image of first view of electronic part is considered to be upper surface image of an IC package to be imaged) ;

(b) a means for light reflection (fig 14, 20 and 22), positioned to reflect a different view of the electronic part into the camera, wherein the camera provides an image of the electronic part having differing views (column 4, lines 1-27) ; and

Although, Suzuki discloses device for imaging object to be inspected and device for inspecting semiconductor package, but fails to specifically mention about calculating a different views of the image using three - dimensional position of at least one portion of the electronic part

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. However, Nayar discloses robotic vision system relates to three-dimensional robotic vision system one camera and at least two elements which reflect light from objects to be located into the camera wherein computer calculates with respect to a given reflection in one of the n spheres the epipolar curve for the reflection in each of the other spheres in order to determine the reflection from each sphere and determine the location of the object associated with the reflections (fig 3, column 3, lines 18- 57), as shown by Nayar the use of calculating a different views of the image using three - dimensional position ... , because the invention relates to a three-dimensional robotic vision system that utilizes one camera and at least two elements which reflect light from objects to be located into the camera in which three-dimensional vision systems has created considerable interest in the development of high quality depth sensors (column 1, lines 20- 39) .

Therefore, it would have been obvious to one with ordinary skill in the art at the time of invention that by incorporate Nayar 's system by calculating a different views of the image using three - dimensional position ... , of Suzuki, because, one with ordinary skill in the art would realize that the invention relates to a three-dimensional robotic vision system that utilizes one camera and at least two elements which reflect light from objects to be located into the camera in which three-dimensional vision systems has created considerable interest in the development of high quality depth sensors, as suggested by Nayar at (column 1, lines 20- 39) .

As per claim 4, Suzuki teaches the apparatus of claim 1 wherein the means for light reflection further comprises a prism (column 8, lines 65- 67).

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As per claim 12, Suzuki teaches the apparatus of claim 1 wherein a maximum depth of focus of a side perspective view (column 2, lines 35-39) allows for a fixed focus system to inspect larger electronic parts (column 3, lines 6-18) , with one perspective view imaging one portion of the electronic part and a second perspective view imaging a second portion of the electronic part (column 3, lines 6-18, column 4, lines 1 - 30) .

As per claim 13, Suzuki teaches the apparatus of claim 1 wherein a maximum depth of focus of a side perspective view includes an area of the electronic part including a center row of balls (column 13, lines 53-68, column 14, lines 1-7) .

As per claim 14, Suzuki teaches the apparatus of claim 13 wherein all of the balls on the electronic part are in focus resulting in two perspective views for each ball (column 14, lines 1-7).

As per claim 15, Suzuki teaches the apparatus of claim 1 further comprising a means for inspecting gullwing and J lead devices (column 6, lines 48-51) .

As per claim 16, Suzuki teaches a method for three dimensional inspection of a lead on a part, the method comprising the steps of:

- (a) using a camera to receive an image of the lead (fig 2(a)) ;
- (b)transmitting (column 2, lines 50-60, column 3, lines 49-64) the image of the lead to a frame grabber (column 7, lines 64-67) ;
- © providing fixed optical elements to obtain a side perspective view of the lead (column 4, lines 20-26) ;

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(d) transmitting the side perspective view of the lead to the frame grabber (column 2, lines 50-60, column 3, lines 49-64) ;

(e) operating a processor (CCD has a processor , column 7, lines 50-53) to send a command to the frame grabber to acquire images of pixel values from the camera (column 7, lines 55-63) ; and

(f)processing the pixel values with the processor to calculate a three dimensional position of the lead (column 14, lines 1-7).

As per claim 17, Suzuki teaches the method of claim 16 wherein the step of processing the pixel values further comprises determining state values from the part itself (column 12, lines 20-67) .

As per claim 18, Nayar teaches the method of claim 16 wherein the lead is a curved surface lead (column 3, lines 40- 45) .

As per claim 19, Suzuki teaches the method of claim 16 wherein the lead is a ball (column 13, lines 59-67).

As per claim 20, Suzuki teaches the method of claim 16 wherein the part is a ball grid array (column 13, lines 53-67) .

As per claim 21, Nayar teaches the method of claim 16 wherein the processor processes the pixel values to find a rotation, an X placement value and a Y placement value of the part relative to world X and Y coordinates by finding points on four sides of the part (note fig 3, transformation between the world and image, column 5, lines 14- 47) .

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As per claim 22, Nayar teaches the method of claim 21 further comprising the steps of:

(a) using a part definition file that contains measurement values for an ideal part (note, world coordination , column 4, lines 41-51) ;

(b) calculating an expected position for each lead (note, lead is a ball or sphere) of the part for a bottom view (camera observe the surface of the spheres s), using the measurement values from the part definition file and the X placement value and Y placement value (column 5, lines 14-47) .

As per claim 23, Nayar teaches the method of claim 16 further comprising the step of using a search procedure on the image to locate the lead (column 8, lines 1-9) .

As per claim 24, Nayar teaches the method of claim 16 further comprising the step using a subpixel edge detection method to locate a reference point on each lead (column 5, lines 48-59)

As per claim 25, Nayar teaches the method of claim 16 further comprising the step of determining a lead center (note, lead is considered to be a ball or sphere) location and a lead diameter in pixels and storing (column 4, lines 18-26), the lead center location and lead diameter in memory (column 8, lines 34-46) .

As per claim 26, Suzuki teaches the method of claim 25 further comprising the step of calculating an expected position of a center of each lead in the side perspective view in the image using a known position of the side perspective view from calibration (column 3, lines 40- 64, column 4, lines 41-68) .

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As per claim 27, Nayar teaches the method of claim 25 further comprising the step of converting the pixel values into world locations by using pixel values and parameters determined during calibration wherein the world locations represent physical locations of the lead with respect to world coordinates defined during calibration (column 4, lines 41-68, column 5, lines 14-59) .

As per claim 28, Nayar teaches the method of claim 27 wherein a Z height of each lead is calculated in world coordinates in pixel values by combining a location of a center of a lead from a bottom view with a reference point of the same lead from a side perspective view (column 4, lines 52- 67, column 5, lines 14- 60).

As per claim 29, Nayar teaches the method of claim 28 further comprising the step of converting the world coordinates to part values using a rotation, X placement value and Y placement value to define part coordinates for an ideal part where the part values represent physical dimensions of the lead including lead diameter, lead center location in X part and Y part coordinates and lead height in Z world coordinates (column 4, lines 52- 67, column 5, lines 14- 60).

5. Claims 2, 3, 5-11, are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al., (US.6,307, 210), in view of Nayar (US.4,893,183), as applied to the above claims 1, 4, 12-29, and further in view of King et al., (US.6, 236, 747) .

Regarding claim 2, Suzuki discloses device for imaging object to be inspected and device for inspecting semiconductor package, but fails to specifically mention about illuminator comprises a ring light . However, King discloses system and method for image subtraction for ball

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and bumped grid array inspection where the ring illumination apparatus 20 includes a substantially ring-shaped light source 24 that generates light beams and directs the light beams into the field of view on the article, column 5, lines 41- 58), as shown by King the use of illuminator comprises a ring light because the system detects quickly and accurately detects absence/presence of the illuminated reflective elements, determines their position, and measures the size and shape, e.g. the diameter and circularity of any protruding object, if desired (column 3, lines 11- 15).

Therefore, it would have been obvious to one with ordinary skill in the art at the time of invention that by incorporate King's system where illuminator comprises a ring light of Suzuki, because, one with ordinary skill in the art would realize that this system detects quickly and accurately detects absence/presence of the illuminated reflective elements, determines their position, and measures the size and shape, e.g. the diameter and circularity of any protruding object if desired, as suggested by King at (column 3, lines 11- 15).

As per claim 3, King teaches the apparatus of claim 1 wherein the means for light reflection further comprises a mirror (column 9, lines 54- 58).

As per claim 5, King teaches the apparatus of claim 1 wherein the means for light reflection further comprises a curved mirror (column 9, lines 55-58).

As per claim 6, King teaches the apparatus of claim 1 wherein the electronic part further comprises a ball grid array (column 5, lines 27-30).

As per claim 7, King teaches the apparatus of claim 6 wherein the electronic part further comprises balls on a wafer (column 5, lines 27-30).

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As per claim 8, King teaches the apparatus of claim 6 wherein the electronic part further comprises balls on a die (column 10, lines 25-29) .

As per claim 9, King teaches the apparatus of claim 1 wherein the means for imaging provides the image to a frame grabber board (note, CCD is considered to be frame grabber , column 5, lines 59-68) .

As per claim 10, King teaches the apparatus of claim 9 wherein the frame grabber board provides an image data output to a processor to perform a three dimensional inspection of a part (column 12, lines 45 - 67, column 13, lines 1-5) .

As per claim 11, King teaches the apparatus of claim 1 further comprising a nonlinear optical element to magnify the image in one dimension (column 15, lines 26-35).

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6. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Contact Information

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sheela Chawan whose telephone number is (703) 305-4876.

If attempts to reach the examiner on Monday through Thursday from 8:30 a.m. to 5:00 p.m. by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta, can be reached at (703) 308-5246.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872 - 9314, (for formal communications intended for entry)

Or: Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703)305-4750.

see
Sheela Chawan
Patent Examiner
Group Art Unit 2625
December 16, 2002

Timothy M. Johnson
TIMOTHY M. JOHNSON
PRIMARY EXAMINER